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COMPUTERWORLD

The Newsweekly for the Computer Community

Weekly Newspaper – Second-class postage paid at Boston, Mass.

Salary Survey
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Computer Made Scapegoat For Large, But Money-Short, Firm

Mr. Robert Healy, president of the ailing Interpublic Group of Companies Inc., said that some of the companies problems were attributable to difficulties in programming the Interpublic's 360. This resulted in inaccurate billings and in delays in sending out the checks, he said.

Mr. Healy acknowledged that Interdata will lose money this year, and a number of newspapers, including the New York Times, and the Los Angeles Times were apparently having difficulty in receiving their money on time. Mr. Healy denied the story that Interpublic agencies owed various media around $6 million in bills past due from 60 to 90 days, and insisted that his information is that the company is current with all its creditors.

Mr. Healy was not available, and the agency which handles the data processing was not answering questions when COMPUTERWORLD contacted them this week.

Stresses Tenacity

New Test For Programming Ability

AABP – Aptitude Assessment Battery - Programming – is a new style of aptitude testing which was recently developed by Professor Wolfe of Brooklyn College, and which is about to come into use. While waiting for the test papers to arrive back from the printers, a spokesman for Brandon/Systems Press, the marketing organization, told COMPUTERWORLD that the major advantage of the test was that it measured a potential programmer's tenacity – as well as his innate logical abilities. He felt that this characteristic would in many cases make the new tests valuable to school and user management even though the new system is more expensive ($6.50 per test) and has to be returned to New York for grading.

The tests are designed to evaluate an applicant's ability:

– to draw deductions with the aid of some simple calculations,

– to understand the explanation of a fairly complicated instruction of the type given in a programming reference manual,

– to understand a rather complicated statement, written succinctly and precisely without further illustration, and

– to reason with symbols in accordance with specific definitions.

Although each problem has a specific answer, the applicant's performance is also based upon the manner by which he secures the answer; hence, he may receive partial credit for any problem even if his specific answer is incorrect. The scoring and evaluation are performed in New York by qualified personnel trained by Professor Wolfe, and will generally be completed within 48 hours after the test is received.

The evaluation that is transmitted consists of three parts: a numerical score based on completion, accuracy, and logical aptitude; an assessment of the anticipated ability of the person to meet the qualifications of a programmer; and a narrative description, where appropriate, to identify and qualify specific traits.

The numerical score is based on a maximum total of 100. In general, scores of 60 or above indicate potentially qualified programmers; scores of 70 or less indicate a person who is probably unqualified. Persons receiving scores between 70 and 80 will have to be considered in light of other characteristics that will be revealed by the test.

There are five problems given – but there is no time limit established for the test. Each problem requires more than thirty minutes of work, and it is hoped that people whose minds wander during debugging from memory dumps will show up as a result of their starting the problems again and again.

War-Front Computers

Computer-In-A-Shelter Arrives In Viet-Nam — More Being Sent

ST. PAUL, MINN., Nov. 30 – The first of six shelter-mounted AN/TYA-20 Computer Compatibility Groups being produced by Sperry Rand Corporation's Univac Federal Systems Division for the Marine Tactical Data System has been deployed in Southeast Asia.

The computer is the heart of the Tactical Data Communication Central of the MTDS, a land version of the Navy's Naval Tactical Data System for which Univac has provided more than 1500 shipboard computers and peripherals.

MTDS is being used by the Marine Corps in Southeast Asia to integrate command and control for the Corps' defensive network of high-speed jet fighters and surface-to-air missiles.

Univac beat the June 1967 target date for delivery of the first AN/TYA-20 group by two months. It arrived at Santa Ana, Calif., Marine Corps Air Facility in mid-April for system integration, demonstration and final acceptance which company spokesmen described as "100 percent successful."

Environmental tests conducted in March at Craig Systems, Lawrence, Mass. (builders of shelter), and the Army's Aberdeen, Md., Proving Grounds included a "helicopter drop" (18-inch free fall and 18-inch drop at each edge), temperature (up to 122 degrees Fahrenheit), humidity, splash-spray equivalent to a 4-inch hourly rainfall, flooding, a 10-mile road test, and railroad "humping" against 5 stationary railcars at 5, 8 and 10 miles an hour.

The second shelter arrived at Santa Ana about June. Four others have since been delivered.

Housed within each ruggedized, transportable shelter is a CP-808 computer (modified Univac CP-642B), a Univac 1538 I/O console, and a special I/O buffer unit for interfacing with other elements of the MTDS.

Overall dimensions of the 4,864 pound shelter are 12 feet long, 7½ feet wide and 7 feet high.

Chicago First

New Computer Society Coming?

A new society for those directly connected with computers and automation has been announced by the Automation Consultant Division of R. Scott Mann and Associates, Chicago. The society will concern itself with continuing education in the EDP field, progress and promotion for all individuals connected with EDP.

There will be no monetary or title restrictions to membership in the organization. Membership is limited only to those who want to promote EDP and the individual in the field.

The society will be dedicated to guiding and promoting individual success in industry, science and government. It intends to accomplish these goals personally by social and academic contacts, and by articles in its universal publications. The society plans seminars, bulletins, brochures and social gatherings.

Disk-Pack Market Seen Expanding At 70% Per Year

In 1968, for the first time, computer users will spend more money for disk-packs than for magnetic tape. This is one of the surprising findings in a study of the market for disk-packs reported in the current issue of "EDP Industry Report", an industry newsletter. The quoted comparisons reveal that the market for magnetic computer tape this year is estimated at $78 million, versus $68 million for disk-packs. However, in 1968, disk-packs are expected to account for $127 million in sales.

As part of their investigation the authors interviewed a number of users, and their comments are included in the report. These appear to confirm that considerable forward planning is needed to avoid problems with pack shortages, but that it can be done.

It also appears to confirm the fact that disk-pack oriented applications are increasing faster than tape applications – perhaps because their potential is now generally appreciated.

Disk packs being turned out at IBM's San Jose plant. This plant has recently been doubled in capacity to prepare for the expected demand.

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Editorials

Programmers' Needs

It it often thought that it is no longer necessary to know assembly languages -- now that we have our COBOLs and FORTRANs, our GPSSs and PL/1s. Indeed many EDP managers are positively annoyed when programmers spend time in keeping up-to-date with the latest assembly language techniques in about the only way they can – that is by using them.

They feel that writing in assembly languages takes time – and it does. They feel that it makes the programmer king – and means that their managerial situation becomes intolerable. Sometimes this is true also.

But what is the alternative?

Running an installation without adequate knowledge of the details of the actual languages used in the computer always carries the risk of not knowing what to do when there is trouble.

At present, the only safeguard is a thorough knowledge of assemblers. Otherwise your company may join the ones like C-E-I-R, and Interpublic and your corporate officers may have to explain that the company fortunes are being affected by poor computer performance.

The British Giant

The new ICT 1906A seems to be a very nice system. It has the necessary design to accommodate many types of use -- which a general-purpose computer should have. It has the compatibility with the past in the form of the already successful ICT 1900 systems, and, most interestingly, with the future in the form of the ability to handle much, much faster memories as they become available.

It even has an apparently realistic (from a user's standpoint) delivery period -- only two years.

COMPUTERWORLD welcomes the new giant.

McNamara's Departure

The forthcoming departure of Secretary McNamara from the Department of Defense will undoubtedly be used as a handy platform from which to try to dismantle many of the policies associated with his name. This will inevitably affect the computer community -- because in the popular mind the Secretary and computers are practically the same thing. While this attitude is not justified, it is real.

It appears probable that there will be some cases where his decisions will be upheld – and some where they will be reversed. Let us hope then when a so-called computerized decision is reversed someone will stand up – and point out that the computers did not fail their human masters.

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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Do YOU Know Your Programs?

Ignorance Poses Time-Sharing Problems And Risks Technological Failure

The spread between a successful computer operation, and the performance of a failure is really not much more than about 50% . . . and therein lies a joint problem between programmers and engineers. The problem lies in the fact that on both sides there is an apparently unknown variable which can affect productivity calculations by many times the difference between success and failure – by many times more than 50%.

On the engineers' side the problem is in providing access to a secondary form of direct access memory which is only about 10 or 100 times slower than main memory – instead of being 1,000 and 10,000 times slower! (See left hand box).

On the programmers' side the problem is being able to know enough about the salient characteristics of a program so that in operation it is not orders-of-magnitude different from the previous "best estimates". (See right hand box.)

While the two problems mentioned have been quite minor in the past – in combination, they can wreck the future.

The User's Future – And that makes these problems important.

Because when a Systems-Designer relies on a mistaken program description he often designs a system which needs access to that oh-so-much-slower secondary memory hundreds of times more frequently than he expected. Performance plummets!

Not by 10%

Not by 50% (which normally marks the difference between clear success and clear failure.)

Not by 90% (that's 10 times slower and more expensive!)

But often by 95% or 99% . . . and that is suicide for a technology.

It has happened in the past –

The IBM Stretch machine failed because programmers did not know how frequently branch instructions occurred – and because the look-ahead instructions were built with wrong programming parameters.

The CDC 6600 very nearly followed the same path.*

The IBM 360/67 paging structure fell down because the programmers wrote programs which only took a tenth of the minimum design time-slice before needing access to the secondary memory.

The problem is very hard to clear up – because the responsibility for the error is hard to pin down.

And it is coming in the future unless either the engineers or the programmers solve their problems.

Or – perhaps, if the engineers just can't give us those memories – I wonder if THEY could solve the programmer's problem for him? That would be as good!

Engineer's Problem

Engineers have always provided programmers with two levels of memory – generally a fast access one, and a slower access one. In the 1950's both levels were on the same device, such as a drum. To get at a location which was just coming under the read-write heads took about 100th of the time it took to get at some randomly placed location. Now, with core memories and their backing up storages, the gap has not narrowed – but widened. Now it takes about 1000 times longer to get at the secondary store than it does to access main store – and if there is a large quantity of secondary store access stress the difference goes up to 10,000 or even 50,000 times longer.

Why the gap is widening is not clear. There have been attempts to put intermediate memories in – most notably IBM's 8 usec cycle time-mass access core. However, they have not caught on –, and so cannot be considered as more than a theoretical solution. Economics were against them.

However, the fact is that the gap is widening. Engineers simply don't appear to be able to reduce the timing gap between the first and second level storage under THREE ORDERS OF MAGNITUDE.

Programmer's Problem

Programmers have always had a problem in estimating the space or even the time that their programs would take. Sometimes the problem became obvious (as when the whole thing had to be rewritten because they ran out of core.) Generally, however, they managed to hide the problem behind the inevitable changes which occur as programs are being written and tested, or behind the limiting performance of the peripheral units. As long as the printer worked at something like 900 lines a minute (or whatever the rated speed was) it didn't really matter that the program loop which the programmer thought would take about 1 msec was actually taking about 10 times that long.

Why the programmer did not have any real idea about the needs of his program is fairly clear. It rarely mattered – and no one had taught him how to describe a program. True, there had been a few attempts. The first Fortran compiler had a "Frequency" statement in it which asked a programmer to say just how frequently a branch would go one way – or the other. But, by and large there was little real knowledge and no real need for it.

Now, the gap between the programmer's knowledge of his program and the actual program characteristics is widening. Operating systems, compilers, multi-programming – all have contributed to their growing ignorance. Many an expert programmer could not recognize more than half of his program if he saw its execution being traced – and he is not to be blamed.

Programmers simply do not appear to be able to describe their programs

Measure For Measure

The Time-Sharing Performance Of The ICT 1906A

[Measure For Measure is an occasional series in which COMPUTERWORLD looks at the claims made by various vendors – and checks out their general validity.]

Now, through a wryly amusing coincidence, we are doing a "Measure for Measure" on a lack of figures! As explained above, there is a major problem involved in time-shared performance estimates because our programmers' descriptions of problems are not sufficiently precise – and because our engineers are so far unable to provide us with an economic memory with an access time which is less than about a hundred or a thousand times slower than the main memory.

As a result, estimating time-shared performance timings is very hazardous.

The ICT 1906A however is a time-shared system. The question was therefore how they were going to describe its capabilities in this area – and how they were going to justify their description.

The Claims

ICT has decided to make no claims about the efficiency of operation of the 1906A in multi-access operation. They have told COMPUTERWORLD that while they have full confidence in the operation of the hardware and of the software they prefer to wait until actual working operation can be measured before making any claims.

The Justification

No specific justification was given – nor was any needed. Both ICT and COMPUTERWORLD were well aware of the problems which have come about in the recent past,

The Verdict

COMPUTERWORLD feels that ICT is fully justified in not making claims at this time. Under the prevailing circumstances any other action would have been very, very dangerous.

However, COMPUTERWORLD feels that the situation also requires that ICT extends quite unusual co-operation to users who have to make these estimates. We hope that when the system does start working some special efforts are made to ensure a policy of fullest disclosure is followed on this matter.

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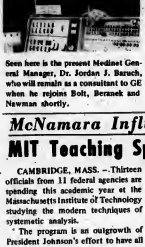
*Sorry – No copies of No. 3 left.

Real-Time Implementation Of Medinet Delayed

WATERTOWN, MASS. – The ambitious GE Medinet network, which was to have started providing real-time services to hospitals this fall has been re-scheduled and the real-time operation will be indefinitely delayed. This will not delay the provision of some service reduced to hospitals but the type of service offered has been changed. The hospitals which were waiting for the Medinet system to go on the air have apparently taken the change in their stride. GE's Dr. Harry Wrage told COMPUTERWORLD "We have some wonderful customers. They are staying right along with us – and with the new policy we will be able to give them service much sooner than we would otherwise have been able to."

Demonstrated in August

The system, as demonstrated to the American Hospitals Association 69th Annual Convention Exhibit in Chicago last August was designed to provide nationwide time-share operation with special terminals being rented to user's by GE. The schedule then called for the full system to be operational in late 1968 or early 1969. While the new plans still provide for going to this style of operation eventually, the actual services to be provided in the immediate future are confined to batch operations, where a subscriber will use his terminal to send and receive data – but can expect a turn-around time measured in hours, rather than in seconds.



Seen here is the present Medinet General Manager, Dr. Jordan J. Baruch, who will remain as a consultant to GE when he rejoins Bolt, Beranek and Newman shortly.

It is known that the new service will be considerably less expensive than the original one would have been, but exactly how much a user will have to pay is not yet known.

Hardware Changes

Changes in the hardware are also expected. The main frame GE 485s are being updated to GE 600s, and the remote terminal (see picture) design is being re-considered in the light of the new plans.

The terminal of the GE Medinet system as it was demonstrated last August. Information can be input from the keyboard, or by the XY position of the cursor on the operator's left.

Users Testing Disk-Packs

HIGH POINT, N.C. – Mac Panel have been quietly delivering test disk-packs to many of their customers over the past few months. These have been for evaluation primarily, as their new disk-pack production facility is not expected to be in flow production for another month's time. At present deliveries are about 60 days.

California Presses On With EDP Plans

An EDP policy group, just created and staffed by Governor Reagan, will have as its prime mission assisting in the consolidation of the data processing systems for the state, and in the co-ordination of the state's operations with those of the various local governmental agencies. The group, which has been named the Office of Management Services is headed by Charles F. Smith, who was senior technical advisor to management in System Development Corporation's Santa Monica facility. A career State Civil Servant, Perry Stauffer, will be the Deputy Director.

Governor Reagan outlined three key functions the Office of Management Services will have:

1–To develop plans for overall consolidation and optimum utilization of automatic data processing systems for state government.

2–To work closely with and co-ordinate with the recently established Intergovernmental Board on Automatic Data Processing which was set up to work with local governmental agencies.

3–To serve as an advisor to the State on matters pertaining to information systems and data processing.

In signing the executive order creating the new office, the Governor said that there has been a rapid advance in the technology of data processing.

McNamara Influence

MIT Teaching Special SA Course

CAMBRIDGE, MASS. – Thirteen officials from 11 federal agencies are spending this academic year at the Massachusetts Institute of Technology studying the modern techniques of systematic analysis.

The program is an outgrowth of President Johnson's effort to have all government agencies use the management, budget control and program planning techniques introduced into the Department of Defense by Secretary Robert S. McNamara.

Individualized Studies

Similar programs are underway at Princeton, Harvard, the University of Wisconsin, Carnegie Institute of Technology, University of California at Irvine, University of Maryland, and Stanford University.

At M.I.T., the special studies are built around a core of instruction dealing with engineering systems analysis, planned program budgeting, cost-effectiveness analysis and systematic policy analysis. However, each participant is permitted to tailor his study to his particular agency and his individual responsibility.

Agencies Involved

Several are enrolled in a special course the M.I.T. Center for Advanced Engineering Study offers its regular mid-career engineering students in the fundamentals of computer operations and programming.

Participants are nominated for the program by their respective agencies and include two from the Department of Agriculture, two from the Post Office Department and one each from the Department of Housing and Urban Development, the Department of Health, Education and Welfare, the Department of State, the Federal Aviation Agency, the Department of the Interior, the Bureau of Customs, the Department of the Army, the Department of Labor and the Civil Service Commission.

MIT Faculty

Among professors participating in the M.I.T. program are Dr. William W. Kaufman of the Department of Political Science and a consultant to the Office of the Secretary of Defense, and Dr. Richard L. DeNeufville of the Department of Civil Engineering who spent 1965-66 in the Office of the Secretary of Defense as a White House Fellow.

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Executive Opportunities

C-1101-7

Computer Systems Director
$25,000 - $30,000 + Bonus

New York City. Our client is a $1 Billion + dynamic, aggressive, and successful corporation. They seek extremely qualified candidate whose principle function will involve the development of business systems specifically to meet management needs; i.e., what do the different levels of management need to really run the businesses, project their future, etc. Mere computer expertise will not suffice but must be one of several strengths which would also include Management Information Systems development and planning, plus considerable entrepreneurial ability.

C-1102-7

Director - Management Services
$25,000 + Bonus

East Central client seeks an individual who would have responsibility for Management Information Systems - Electronic Data Processing Operations & Systems and Operations Research. A preferable candidate would have primary strength in Management Information Systems and Business Systems and have an undergraduating of, and be able to relate, EDP and OR to the Financial Planning and control of a company.

Another client is looking for a very similar individual in the southeast at a salary of $25,000 - $30,000 + Bonus.

C-1103-7

Corporate Director - Management Science
$30,000 + Bonus

New York City. One of the country's largest and most prestigious industrial corporations is seeking a Director of Management Science (Operations Research). An appropriate candidate would have to have an exceptionally good technical background personally in the Operations Research area and have a successful record of having managed, and have implemented under his direction, broad and diverse projects having significant impact on a company's business, planning, strategy, etc. Must also be capable of managing a multi-disciplinary Management Science group of very high professional competence and of dealing effectively at the highest corporate managerial levels.

This same client also seeks an outstanding O.R. Internal Consultant, subordinate to the above, at about $20,000 - $25,000 and an Applied Statistician to also act as an Internal Consultant in the same department at $20,000 - $25,000 +.

C-1104-7

Management Information Systems
$20,000 - $30,000 +

New York City Internal Consultant on conceptualization, development and implementation of Management Information Systems at Corp. and divisional levels for one of country's largest industrial Corpt. Particular interest in Manufacturing, Production Control, Inventory Control, etc. Although candidates will have to be quite knowledgeable concerning utilization of computers, including real-time systems, they are more interested in the kind of an individual who can help their management determine what kind of information is necessary for decision making, and who are more systems and problem oriented than hardware oriented. However, it must be emphasized that extensive, large-scale hardware capability familiarity is required. Opportunity for advancement to senior managerial responsibilities.

C-1105-7

Director - Management Science Division
$25,000 - $30,000 ++

Midwest. One of the country's more prominent management consulting firms, with an extremely well established clientele, seeks an outstanding Management Science-Operations Research Manager. A suitable candidate will not only have exceptional technical strength, but he will have to be a very capable manager responsible for recruiting, training and developing an entire staff. (We of course, will be more than pleased to help him once hired.) He should also be entrepreneurially oriented in terms of developing the business and profitability of this soon to be established division. The candidate hired will start as a principle and will not be hired unless he can be expected to achieve partnership within two years or so.

C-1106-7

Director - Management Information Services
$30,000 + Bonus

North Central. Will assume complete responsibility for the conception, development and implementation of both Operations Research-Management Science & Management Information Systems programs throughout this multi-plant corporation. Hopefully, in addition to being technically strong in the OR and MIS areas, should be capable of promotion to Financial Vice President within several years.

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Detailed and comprehensive listings of employment opportunities in the Management Information Systems – Electronic Data Processing – Operations Research – Management Sciences – Economics – Econometrics fields are available upon request.

Calendar

CONFERENCES, SYMPOSIA

Jan. 18 - 19, 1968, Tampa, Fla. – First Annual Simulation Symposium, Sheraton-Tampa Motor Inn. Contact: First Annual Simulation Symposium, P.O. Box 1155, Tampa, Fla. 33601.

Feb. 22 - 23, 1968, New Orleans, La. – Assn. of Data Processing Service Organizations Management Conference. Contact: Jerome L. Dreyer, Automatic Data Processing, Inc., 1040 Highway 46, Clifton, N.J. 07013.

Mar. 14 - 16, Houston, Tex. – Sixth Annual Symposium on Biomathematics and Computer Science in the Life Sciences. Contact: Office of the Dean, Univ. of Texas, Graduate School of Biomedical Sciences, Division of Continuing Education, P.O. Box 20367, Houston, Texas 77025.

Apr. 3 - 5, Washington, D.C. – 1968 Intermag Conference. Contact: IEEE, 345 E. 47th St., New York, N.Y. 10017.

Apr. 30 - May 2, Atlantic City, N.J. – Spring Joint Computer Conference. Contact: AFIPS, 345 E. 47th St., New York, N.Y. 10017.

USERS MEETINGS

Jan. 22 - 23, North Hollywood, Calif. – "IV League", users of informatics' Mark IV File Management System, third meeting. Sportsmen's Lodge.

EDPeople

Scranton Goes To IBM World Trade Board

Gottschalk

Mr. Vincent Gottschalk has joined *Control Data Institute*, a computer training division of Control Data Corporation as Placement Administrator. He will work at the Arlington, Va. location of CDI.

Mr. John R. Goebel of the Cleveland office of *Statistical Tabulating Corporation*, has been appointed to the position of Production Manager. Mr. Goebel has had 12 years experience in the data processing field.

Eugene F. Uretz has been promoted to Senior Scientist with the Computer Sciences division at *IIT Research Institute*.

Mr. Uretz recently conducted research on techniques for automatic processing of information stored by optical means. He developed a system which displays three dimensional images from computer-generated 16 mm movies.

In order to broaden the top management structure, and to place a major emphasis on a new division for systems and software programming, *Comress Corp.* has made some changes in its top management. Mr. Paul C. Clisura has been appointed Vice President, Product Sales; Mr. I. Anthony Frye, Vice President of Systems software; Mr. Joseph Winetka, Vice President, Technical Applications, and Mr. Burnett G. Anderson, Vice President of Corporate Planning.

William Warren Scranton, former governor of Pennsylvania, has been elected a director of *IBM World Trade Corporation*.

The appointment of Alf Kalvenes as manager of geosciences for the Houston regional office of *McDonnell Automation Company*, a division of McDonnell Douglas Corporation, was announced by a company spokesman.

Klaveness will be responsible for all geophysical and geological data processing services and consulting, including seismic, oceanographic and petroleum and gas exploration applications.

Truitt

Thomas D. Truitt has been named Vice President of *Applied Logic Corp.*, Princeton, N.J.

Mr. Truitt will be responsible for the installation and operation of Applied Logic's second time-sharing system, utilizing the large scale general purpose PDP-10 computer with additional memory (storage) equipment.

Philip I. Pesapane, noted data processing authority, has been elected executive vice president and Director of *Computer Procedures Corporation*, Mineola, N.Y.

As an authority in the field, Mr. Pesapane has lectured on data retrieval, microfilming and data processing.

URS Corp. has named William A. Rose as Director of the Management Control Staff, and Ronald L. Olsen as Director of the Technical Control Staff of its Information Sciences Division in Alexandria, Va.

Theodore G. Johnson and Peter J. Kaufman have been elected to Vice-President, Sales and Vice-President, Manufacturing, respectively, of *Digital Equipment Corporation*, Maynard, Mass.

Johnson

Mr. Johnson joined in 1968 and was instrumental in developing its field organization on a worldwide basis.

Mr. P.J.Kaufman joined Digital in 1966 as Manufacturing Manager and is responsible for all volume production operations.

Harold F. Maxon has been appointed manager of marketing research for *General Electric Company's Information Systems Marketing Operation*.

He will be responsible for analysis of computer marketing trends and preparation of forecasts. His work will include surveys of computer systems applications, new products and market opportunities, and measurement of market activities and progress.

Varian Data Machines has appointed E. Floyd Sherman as Western District Sales Manager.

Mr. Sherman has been with Control Data Corp. since 1960. Most recently he was Sales Manager for the firm's West Los Angeles district.

Kenneth G. Harpke has been named Director of Development Engineering at *Systems Engineering Laboratories, Inc.*

Previously he was General Manager of Digital Products Division of Canoga Electronics, Calif.

$25 Million Deal For Burroughs In Offing — Another British Bank!

Family Radio Network, operators of a chain of radio stations, announced the placement of an order for a Univac 9200 Computer System. Family Radio, which has stations in San Francisco, Sacramento, San Diego and Bakersfield, Calif., Houston, Tex. and Newark, N.J., will use the computer for revenue accounting, compilation of statistical information, and for various general accounting purposes.

DATA CENTER TIME WANTED

with 200-300 open hours per month. Must be IBM 360, New York City location. High Commission. Confidential.

COMPUTERWORLD
BOX 1744.

Systems Engineering Laboratories, Inc., has announced the lease of a 40,000 square foot building here. This major expansion increases the company's Fort Lauderdale facilities to about 100,000 square feet of plant area. The new facility will be used primarily to house the company's computer and analog product production facilities. The company's existing building will continue to house development, administrative and custom systems operations.

Two automatic analyzer data reduction computer systems that perform both clinical and biomedical laboratory analyses have been installed by *Realtime Systems Inc.*, N. Y. an affiliate of Levin-Townsend Computer Corporation. The new systems enable a single laboratory technician to run up to 750 analyses in a normal workday. All test results are available within minutes in printed form as well as on punched paper tape for further computer processing.

Two Univac 494 Real-Time Computer Systems, representing an investment of several million dollars, have been supplied to the Travelers Insurance Company's home office here by *Sperry Rand Corp.'s* Univac Division.

Replacing Univac 490 and 492 Systems operated by the Travelers since 1965, the Univac 494's will assist in rapid-handling of claim service, allow more flexible processing of coverage changes, and improve the quality and quantity of underwriters information with which to evaluate risks.

Southern Memorial Services, owners of eight cemeteries in Alabama and Georgia, announced today the placement of an order for a Univac 9200 Computer System from *Sperry Rand Corporation's* Univac Division.

The computer, scheduled for installation in December, will be used for maintaining an up-to-date accounts receivable, inventory, for processing of a perpetual care fund, for updating commission payments, and payroll preparation.

Orders and Installations

Burroughs, along with *Plessey Automation Group*, is in an advanced stage of negotiations with Britain's *National Provincial Bank* to supply a large scale computer on-line system. The value of the computer equipment to be included in the network is estimated to be between $25 and $30 million. A Burroughs B8500 will be linked via a telephone data communication network to Burroughs terminal computers in each of the bank's branches.

The terminal computers will have instant access to the B8500 central computer by means of telephone lines. Information flow within the system will be controlled by the B8500.

Techelloy Company, Inc., producers of rod and strip wire composed of stainless steel and high nickel alloy, announced the placement of an order for a Univac 9200 Computer System. When installed next summer, the computer will replace tabulating equipment presently being used for handling accounts receivable and payable, for inventory inventory and invoicing.

Systems Engineering Laboratories, Inc., has announced the receipt of a $195,000 contract from *Grumman Aircraft*, Computer Engineering Department, Bethpage, Long Island, New York, for an SEL 840A computer system. The system will be used to drive F-111B aircraft electronic equipment in a real-time simulated flight.

The contract calls for an SEL 840A 24-bit digital computer with 12K memory, Systems Engineering Laboratories peripheral devices and a full time resident field engineer.

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British Giant Computer Announced While US Ones Vanish

Multi-Access System Ranges From 0.5 To 2 Million Insts/Sec

ICT 1906A To Be Compatible With 1900s.

A giant computer, the 1906A, which is said to be more powerful than the IBM System 360/90s, is being introduced by the British firm International Computers & Tabulators Ltd. ICT is offering a two year delivery, prices of $1.2 million upwards, batch-processing and a built-in capability to take advantage of the future developments of faster memories. They are expecting to sell about 40 of the giant systems.

The system is an entirely British Design, leaning on the experience gained by Ferranti Ltd. (since merged into ICT) with their Atlas computers. However, some of the actual parts are presently being provided by American suppliers – notably Motorola and Bryant Computer Products.

The ICT 1906A will be able to use the software presently developed for the smaller members of the 1900 family, but further special software is being developed for the system. Special attention is being paid to the need to allow multi-stream operations (that is where a number of different job stacks are being simultaneously handled.) This will allow for both real-time and time-shared operations from remote terminals to be run in conjunction with normal batched processing.

A paging system is available for multi-access operation. This will be supported by a special operating system, George 4.

The market at which the system is aimed is primarily the 16% of the British market which handles machines this size. ICT eurrently claims that they have one third of this market, and expects the future to bring both an expansion in their share of the market, and an expansion of the market itself. Prime customers are expected to be universities, research centers, and the very large commercial users. In addition to this area, ICT 1906A will form the central component of the company's proposals for super-scale systems for British government use.

With regard to devaluation problems, ICT told COMPUTERWORLD that devaluation and the government measures which accompanied it involve a number of factors with both positive and negative implications for ICT.

In the U.K. dearer finance, the withdrawal of special bonuses, higher transport charges, import of special components etc., will cause a rise in costs, but ICT believes that it will be markedly less affected than its main competitors by the increased cost of imports.

The cost of overseas sales will also tend to rise, but devaluation will give ICT the possibility of increasing its price competitiveness, or its profitability, in overseas markets where devaluation has not taken place. They anticipate increased profitability by higher volume of sales. However, it may not be possible immediately to benefit to the fullest extent from this because increased marketing expenditure will be incurred before the effects of the higher volume of sales are felt. One third of ICT's production is at present exported.

In the U.K. they anticipate an initial slackening in the rate of order taking followed by a possible increase in rentals as compared with outright sales.

Technical Specification

ICT 1906A Hardware & Software

Technical Specifications

Word Length: 24 Bits
Core Size: 64K to 4,096K words
Cycle Time: 750 nanosec. with 2 or 4 way interleaving, depending upon core store size.

Instruction Times

Commercial – 0.94 microsec for 2-way interleaving.
0.84 microsec for 4-way interleaving.
Scientific – Floating Point Add – 0.9 microsec
Floating Point Multiply – 2.8 microsec.
Floating Point Divide – 7.0 microsec.

Computation Styles

Batched-Processing
Multi-access operations
Mixed Batch and Multi-access

Paging

Page Size – 1,024 words
Page Addressing – 16 associative registers backed up by tables in core.
A learning program controls the selection of blocks in store.
Back-Up Store – Type 2851 Drums, average access 6 millisecords, 1.4 million chars/second transfer rate, 2 million chars capacity.

Compatibility

Compatible with present ICT 1900 systems.
Compatible with 100 nanosecond store if one becomes available.

Software

Operating Systems:
George 3 Operating System – believed to be nearing completion. This will provide conversational multi-access operation with foreground background operation under the control of the priority system.
Requires 500,000 words of direct access store.
George 4 Operating System – being developed on the basis of George 3. Allows similar facilities in paged systems.
Compilers:
Not yet specified precisely, but will be available.

New Peripherals

New 1,600 cards-per-min reader.
New Drums, 2 million chars capacity, 1,400,000 chars/sec transfer rate, 6 millisecords average access.

Engineering Characteristics

Monolithic circuits using Emitter-Coupled Logic (supplied by Motorola).
Multi-layered Printed Circuit Boards.

Delivery Schedules

First Engineering Prototype	Now in operation
Full Engineering Prototype	Spring 1968
First Production Prototype	Late 1968
First Customer Delivery	Fall 1969

Input-Output Channels

Total system capacity – 5 million chars per sec.
Slow Speed Channels – Up to 5 – 50,000 chars/sec.

American Contributions to Design

Two American manufacturers have made major contributions to the design – Bryant and Motorola.

Bryant has supplied the fast drums, with the fantastic transfer rate of 1,400,000 chars/sec. These drums are being used to back up both the George operating system and the paged operations.

Motorola has supplied the monolithic emitter coupled logic integrated circuits. Several thousand circuits have been delivered already. The particular importance of the circuits is that they can operate with memories much faster than any presently available, and so will help in keeping the performance of the ICT 1906A up to date. The outside limit for the potential speed of memories which can be incorporated in future 1906As without changing the logic is 100 nanoseconds.

Price

Between $1,200,000 and $3,000,000 purchase price – equivalent to rentals of $24,000 – 360,000 per month.

Market

ICT currently expects to sell 40 systems; no orders at present. However, universities, research centers and large commercial users are all considered probables.

Currently ICT has one-third of the United Kingdom computer market.

Competition with other British manufacturers is almost certainly limited to that from the merged English Electric and Elliott Automation concern. However, it appears unlikely that EE-EA will provide much competition in this area for some time to come – and then it may be too late for them to recover.

Competition from other sources is practically limited to American systems. ICT claims that the 1906A in its present form is more powerful than the 360/90 series, or the Univac 1108s. Perhaps significantly, no statement was made comparing the new system with the CDC 6600 – or the unannounced CDC 7600.

Card-Reader For Use With Bell 401 Sets Replaces IBM 1001s

WYCKOFF, N.J. – A tab card reader that is designed to replace the IBM 1001 has been introduced by Verna Industries here. The company claims that their card reader will process any standard 80-column, 12-row card at a speed of ten cards per minute, in contrast to the IBM card reader which reads 20 columns per minute.

The Verna card reader is available with manual feed or an automatic hopper feed for semi-unattended service. For transmitting information not on cards, a numerical or alphabetical keyboard is included. Reading speed is 15 columns per second.

The card reader is intended for use with the Bell System 401 series Data Phones. The cost of the unit is approximately $890 for small quantities.

Where to Write

A mention of Computerworld when writing will be appreciated

Brandon/Systems Press, (aptitude test), 30 East 42 St., New York, N.Y., 10017.

Computer Usage Development Corporation, (Bank Americard contract), 344 Main St., Mt. Kisco, N.Y.

Control Data Corporation, (tape transport), 8100 34th Ave. South, Minneapolis, Minn. 55440.

EDP Industry Report, (industry newsletter), 355 Walnut St., Newtonville, Mass.

Mac Panel Company, (disk-pack), P.O. Box 5027, High Point, N.C. 27262.

Verna Industries, (tab card reader), 455 West Main St., Wyckoff, N.J. 07481.

A 360 Match-Merge Utility is available that emulates a collator's capabilities. Program is record and device independent, input and output files may have any desired physical record size. Price: $1,000. Write for documentation.
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2" Wide Tapes

A Million CPS — From Mag Tape

One of the new 2" tape units which have just been delivered by Control Data. The new units can transfer data at over twelve million bits per second.

MINNEAPOLIS, MINN. – Control Data Corporation has developed a high performance magnetic tape transport claimed to be capable of transferring data 15 times faster than conventional tape transports. Two of the new units have already been delivered to Ball Telephone Laboratories, Greensboro, North Carolina, for use in a military research and development program.

Utilizing integrated circuitry, the new Control Data tape transport transfers data at the rate of 12.8 megabits per second, – equivalent to 1,300 KB – with a 150 inch-per-second tape speed. Approximately four billion bits of data can be stored on a single 3,600-foot reel of tape. The two-inch magnetic tape used on the transport is certified by the firm.

The new tape transport has a 36-track head which records in two modes: a continuous mode of variable length records with no inter-record gaps; and the standard mode of variable length records with one-inch inter-records. The tape units themselves are only 4" deeper than conventional ones.

How They Moved Last Week

Week Ending December 1, 1967

	1967 High	1967 Low	Week High	Week Low	Last	Week Net Change	Week % Change
NEW YORK STOCK EXCHANGE							
Addressograph-Multigraph	35 1/4	46 7/8	49 7/8	46 1/8	49 7/8	+ 3 1/8	+ 6.69
American T&T	171 1/8	37 3/4	171 1/8	165	170	+ 5 1/8	+ 1.00
Ampex Corp.	40 3/4	22 3/4	37	34 1/2	35 1/2	+ 3/4	+ 2.16
Burroughs	174 1/4	80 7/8	174 1/4	162 5/8	171 3/8	+ 3 7/8	+ 4.52
Collins Radio	116 7/8	53	96	91 3/8	93 1/4	+ 6 1/4	+ 6.67
Control Data	165	33 1/2	165	157 1/2	161 1/4	+ 3 1/4	+ 2.06
Electronic Associates	30 1/4	16 1/4	21 5/8	21 1/4	22	- 5/8	- 2.76
General Electric	112 7/8	82 1/2	108	101 1/4	103 7/8	- 1/8	- 0.12
Honeywell	109 7/8	83 1/2	109 7/8	106 5/8	108 1/8	- 1 5/8	- 1.27
IBM	620 1/2	362 1/2	618	610	616	+ 2	+ 0.23
Litton	120 3/8	75 1/2	116 1/8	107 1/2	107 7/8	- 4	- 3.58
Nat Cash Register	135	67 3/8	135	122 1/2	131 1/4	+11 1/8	+ 9.25
NCR	85 1/2	42 5/8	56	53 1/2	54	- 1 3/8	- 2.40
Northern Pacific	116 1/4	93	116 1/4	109 1/2	115	+ 6 1/4	+ 5.86
Sanders	70 1/4	37 5/8	66 3/8	64	66 1/8	+ 2	+ 3.12
Scientific Data	144 1/4	70 3/8	144 1/4	136 3/4	144	+ 4 3/8	+ 3.13
SCM	82 1/4	41 1/2	54 1/4	49 5/8	52 1/4	+ 2 5/8	+ 5.24
Sperry Rand	46 3/4	28 1/8	40 3/4	37 1/8	39 5/8	- 3/8	- 0.92
NYSE COMPUTER STOCK AVERAGE						+ 2.93	+ 1.86
AMERICAN STOCK EXCHANGE							
Audio Devices, Inc.	57	41 1/2	57	52 1/2	57	+ 2	+ 8.70
Automatic Data Processing	25 3/8	5 1/4	25 7/8	23 1/4	25 1/8	+ 2 5/8	+ 9.77
CalComp	95 1/8	66 1/4	82 3/8	76 1/2	75 5/8	- 2 1/4	- 2.89
Computer Applications	41 7/8	16	41 7/8	36 5/8	41 7/8	+ 5 1/4	+15.51
Computer Science	49 1/8	18	49 1/2	44 1/4	49 1/8	+ 4 1/8	+ 9.78
Digital Equipment Corp.	142 3/4	29 3/8	142 3/4	125	139 1/4	+39 7/8	+216.58
GC Computer Corp.	41	21 1/4	29	26 3/8	28 3/8	+ 2	+ 7.75
Leasco	101 3/4	33 5/8	101 3/4	90 1/4	99 3/4	+ 5 1/4	+10.83
Levin-Townsend Computer Corp.	53	10 1/8	50 3/4	43 5/8	45 3/8	+ 1 7/8	+ 8.80
Milgo Electronics	15 1/8	5 1/8	12 1/8	10	11 3/4	+ 1 7/8	+28.95
Mohawk Data Sciences	187 1/2	151 1/8	187 1/2	170	182 1/2	+10 1/4	+ 5.95
Planning Research	73	49 3/8	73	71	72 3/8	+ 1 1/2	+ 4.29
Potter Instrument	41 1/4	12 1/8	32 3/4	29 5/8	+ 35 7/8	+ 1 1/8	+ 4.51
Randolph Computer Corp.	64 7/8	32 1/2	62 1/2	35 7/8	62 1/2	+ 6 1/2	+18.06
AMEX COMPUTER STOCK AVERAGE						+ 6.97	+ 8.42

OVER-THE-COUNTER	1967 High Bid	1967 Low Bid	Friday Bid	Friday Asked	Last Friday Bid	Week Net Change	Week % Change Bid
Applied Data Research	30	3 1/8	28	30	25	- 4	- 3.45
Basic, Network & Memory, Inc.	30	8 1/4	22 3/4	23 1/4	23 1/4	- 1	- 4.21
Computer Image	44	20 1/4	35	38	38	- 3	- 5.27
Cyber-Tronics	17 1/2	4 3/4	10 1/8	10 5/8	10 3/4	- 5/8	- 5.91
Data Products	23 1/4	7 1/2	22 1/8	22 1/2	18 5/8	+ 3 1/2	+18.79
Digitronics	18 1/4	4	16 3/4	15 1/4	14	+ 3/4	+ 5.36
DPA, Inc.	14 1/4	4 1/4	7	7 3/8	8 3/4	- 1 1/4	- 8.86
Electronic Memories	54 3/4	12 1/4	48	45	44 3/4	+ 1 1/4	+ 2.87
Fabritek	15 3/4	4	12 1/4	12 3/4	9 1/4	+ 2 1/4	+32.88
LNC Data, Inc.	13 5/8	8 1/8	10 1/2	11	10	+ 1/2	+ 5.00
Management Assistance	24 1/8	10 1/8	11 1/2	11 1/4	10 1/4	+ 1 1/4	+12.20
Memtex	224	63 1/2	189	192	190	- 2	- 1.03
Mergenthaler Linotype Corp.	42 1/2	25 1/4	37 1/2	37	37 1/2	+10	+31.31
Mohican Equipment Corp.	185	137 1/2	147	145	147	+10	+10.22
Process Engineering Labs	56 1/4	6 7/8	56	52	50 1/2	+ 5 1/2	+50.69
University Computing Co.*	179	45 *	179	182	354	+25	+16.23

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Salary Survey Part 4 — Operating Personnel

The Operational Highs Are On The Pacific Shore

Personal Page

This week the last part of a 4-part series covers the job functions of Supervisor of Computer Operations, Computer Operator, Tab & Peripheral Equipment Supervisor and Tape Librarian. The duties of these operational personnel are shown below, in order to avoid problems with titles which are certainly not standardized.

Earlier parts of the series appeared in COMPUTERWORLD on October 4th, 11th, and 25th. Copies of these issues can be obtained from the Back Issues. Department, Computerworld, 129 Mt. Auburn Street, Cambridge, Mass. 02138, at a dollar each.

Supervisor of Computer Operations

Plans, organizes, and administers computer and peripheral equipment operations.

Direct Responsibility: Scheduling the use of computer equipment for maximum efficiency; directing the training of operational personnel; preparation of assignment schedules for Operations Personnel.

Computer Operator

Monitors and controls a computer.

Direct Responsibility: Correct and efficient computer operation; control of computer console; recording of required operational data.

Dealt with: Programming and Systems Analysis Personnel on specific program requirements.

Responsible to: Supervisor of Computer Operations.

Tab and Peripheral Equipment Supervisor

Plans, organizes, and administers the peripheral and tabulating equipment used to support the computer installation.

Direct Responsibility: Efficient utilization and peripheral equipment and tab units; assignment of personnel; scheduling of work flow, direction of training of equipment operators; direction of personnel in his department.

Dealt with: Installation technical personnel with regard to the execution of computer applications.

Responsible to: Supervisor of Computer Operations.

Tape Librarian

Maintenance of a paper and/or magnetic tape library containing computer-readable data.

Direct Responsibility: Cataloging content of reels of paper and magnetic tape, assignment of storage areas; preparation of reference files for reel location.

Dealt with: Technical staff members; other library personnel.

Responsible to: Supervisor of Computer Operations and/or Tab and Peripheral Equipment Supervisor.

TABLE 1
AVERAGE WEEKLY SALARIES

Geographic Area \ Title	Supervisor Computer Operations	Computer Operator	Tab & Peripheral Equipment Supervisor	Tape Librarian
New England	$171	$106	$137	$102
Middle Atlantic	178	112	167	102
South Atlantic	157	108	152	97
E.North Central	181	112	164	102
W.North Central	173	108	158	98
E.South Central	161	98	141	95
W.South Central	173	115	154	98
Mountain States	178	114	159	97
Pacific States	187	119	171	106
National Average	$175	$112	$160	$104

TABLE 2
ESTIMATED TOTAL NUMBER OF PEOPLE EMPLOYED

Geographic Area \ Title	Supervisor Computer Operations	Computer Operator	Tab & Peripheral Equipment Supervisor	Tape Librarian
New England	1200	4900	800	900
Middle Atlantic	3400	15000	2100	2300
South Atlantic	2000	8100	1500	1100
E.North Central	3600	15000	2800	2200
W.North Central	1200	5100	800	750
E.South Central	600	2450	400	380
W.South Central	1200	5100	800	870
Mountain States	550	2400	400	400
Pacific States	2100	9800	1300	2000
National Total	15,850	57,850	10,900	10,890

Coming Next Year

New Fortran Bulletin Coming ACM's SIGPLAN To Sponsor It

Users, students and implementers of Fortran will have a new forum for information with the publication of the *Fortran Information Bulletin*. The bulletin will be published by the Special Interest Group on Programming Languages (SIGPLAN) of the Association for Computing Machinery, as an occasional supplement to SIGPLAN notices, the Group's informal monthly newsletter. The new bulletin is available to SIGPLAN members only. Membership in the Group costs $6 for ACM members and $7 for non-members.

Professor Hellmut Golde of the University of Washington has been appointed editor of the Fortran bulletin.

Christopher Shaw, SIGPLAN chairman, said the first bulletin will probably appear early in 1968. The bulletin will be published at irregular intervals, as the amount of material dictates.

Professor Golde is soliciting contributions on the following topics: (1) Details of all Fortran implementations, relating them to the published USA standards, (2) Interesting applications of Fortran to unusual problems, (3) Suggestions for improvement to the language, (4) Interesting details of Fortran compilers, (5) Pitfalls in Fortran programming, (6) Working papers on Fortran, and (7) News and notices.

Contributions should be sent to him at the *Fortran Information Bulletin*, University of Washington, Department of Electrical Engineering, Seattle, Washington 98105.

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1 ☐ Mining or Construction
2 ☐ Manufacturer of Computers or Data Systems
3 ☐ Manufacturer (except computers or data systems)
4 ☐ Utility
5 ☐ Wholesale/Retail
6 ☐ Transportation
7 ☐ Business or DP Services
8 ☐ Systems Service (except DP)
9 ☐ Accountancy, Banking or Legal
10 ☐ Government/Military
OTHER (Please specify)

YOUR TITLE AND/OR FUNCTION?
A ☐ Operations Management (non-engineering). Dir. of Computer Center, Manager EDP, Head of Systems, Mgr. of Programming Dept. etc.
B ☐ Programmer and Staff Systems Programmer, Systems Analysts, Application Programmer, Mathematician, Oil Specialist, Dir. Supervisor, and related positions.
C ☐ Corporate Officers, Owners, Partners, General Managers, etc.
D ☐ Engineering Management Chief Engineer, Dir. of R&D, Project Manager, etc.
E ☐ Engineering or Scientific Engineers, Scientists, Physicists, Chemists, Technicians, etc.
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Straight Benchmark Timings Used

Honeywell Beats Out IBM, NCR For Army $8.6 Million Contr 'ct

WELLESLEY HILLS, MASS., Nov. 28 – Honeywell, Inc. has been notified in a letter of intent by the Defense Supply Agency (DSA) of its plans to lease 22 computers valued at $8.6 million.

The computers will be installed in 11 Defense Contract Administration Services Regions (DCASRs) of DSA to process data on more than 270,000 Defense Department contracts totalling $49 billion. They also will be used to report on the status of vendor production, quality assurance, invoice control, accounting services, and other functions necessary for production and timely delivery.

Honeywell was selected as the supplier after a thorough benchmark test administered by DSA. The multi-computer system, which will lease for about $172,000 per month when the system is fully implemented, replaces a variety of data processing systems now in use. DSA has the option to purchase the equipment at any time, it was said.

In addition to the 22 computers leased for regional use, a Model 2200 has already been shipped to DSA's Data Systems Automation Office and Testing Laboratory, Columbus, Ohio. It is being used for program testing and actual design of the DCAS system. Regional offices will receive their systems during the first half of next year, Honeywell said.

To Install 2200 and 200

Following completion of pilot activities at DCASR Detroit, DSA plans to install a Model 2200, coupled with a smaller Model 200, in each DCAS regional office in Boston, New York, Chicago, Los Angeles and Philadelphia. Besides Detroit, other regional offices in Dallas, San Fransisco, Atlanta, Cleveland and St. Louis will receive a Model 1200 and a 2000.

Defense Contract Administration Services was organized almost two years ago to consolidate management of Armed Forces' contracts. Efforts since that time have been directed at fully-automating the DCAS functions under a program called MOCAS (Mechanization of Contract Administration Services.)

The Honeywell contract was awarded after the evaluation of benchmarks which used data volumes identical to those expected by the agency. The function of the benchmark was to validate the timings given in the proposal, and, when validated the timings were not afterwards used to base a set of extrapolation as was the case with the ill-fated Air Force Phase II proposal.

The award went to Honeywell after the agency had established that over a 36-month period the Honeywell proposal was the least costly to the country.

EDP industry report
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A Comprehensive Computer Census Is Available

EDP Industry Report is now the *exclusive* source for the comprehensive Monthly Computer Census prepared by the International Data Corporation (IDC), which publishes the newsletter. The tabulation, which has appeared in the past in *Computers and Automation*, is made possible through an extensive market information gathering and research program conducted by IDC's research staff.

Computer manufacturers, virtually without exception, do not officially release information about installations or unfilled orders. Thus, reliable secondary sources of this market information must be developed. And IDC, during the past four years, has developed proven data collection and analysis techniques . . . techniques that produce each month the computer census commonly acknowledged by those inside the computer industry to be *the most timely and consistently reliable picture* of the total computer market.

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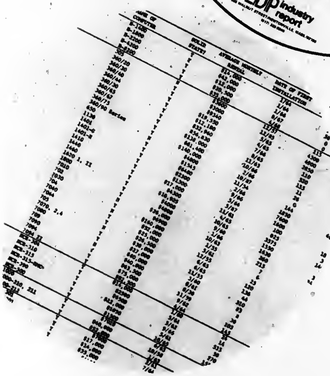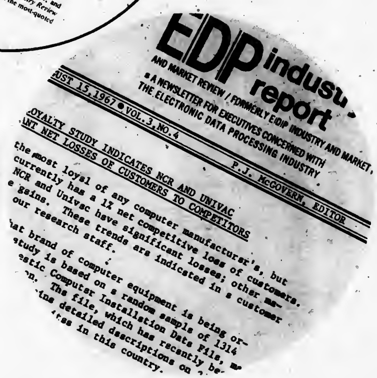
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